Ecological site F134XY203AL
Western Alkali Flatwoods - PROVISIONAL

Accessed: 12/08/2023

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 134X–Southern Mississippi Valley Loess

The Southern Mississippi Valley Loess (MLRA 134) extends some 500 miles from the southern tip of Illinois to southern Louisiana. This MLRA occurs in Mississippi (39 percent), Tennessee (23 percent), Louisiana (15 percent), Arkansas (11 percent), Kentucky (9 percent), Missouri (2 percent), and Illinois (1 percent). It makes up about 26,520 square miles. Landscapes consist of highly dissected uplands, level to undulating plains, and broad terraces that are covered with a mantle of loess. Underlying the loess are Tertiary deposits of unconsolidated sand, silt, clay, gravel, and lignite. The soils, mainly Alfisols, formed in the loess mantle. Stream systems of the MLRA typically originate as low-gradient drainageways in the upper reaches that broaden rapidly downstream to wide, level floodplains with highly meandering channels. Alluvial soils, mostly Entisols and Inceptisols, are predominantly silty where loess thickness of the uplands are deepest but grade to loamy textures in watersheds covered by thin loess. Crowley's Ridge, Macon Ridge, and Lafayette Loess Plains are discontinuous, erosional remnants that run north to south in southeastern Missouri - eastern Arkansas, northeastern Louisiana, and south-central Louisiana, respectively. Elevations range from around 100 feet on terraces in southern Louisiana to over 600 feet on uplands in western Kentucky. The steep, dissected uplands are mainly in hardwood forests while less sloping areas are used for crop, pasture, and forage production (USDA-NRCS, 2006).

This site primarily occurs on the terraces of the Western Lowlands Pleistocene Valley Trains (EPA Level IV Ecoregion: 73g; Woods et al., 2004). Additionally, the soils of this site have been mapped locally on low-lying areas of Crowley's Ridge and to the east on the Northern Holocene Meander Belts (EPA Ecoregion: 73c; Woods et al., 2004). The distribution of this site spans the boundaries of MLRA 134 and MLRA 131A (Southern Mississippi River Alluvium).

Classification relationships

All or portions of the geographic range of this site falls within a number of ecological/land classifications including:
-NRCS Major Land Resource Area (MLRA) 134 – Southern Mississippi Valley Loess
-NRCS Major Land Resource Area (MLRA) 131A – Southern Mississippi River Alluvium
-Environmental Protection Agency's Level IV Ecoregion: Western Lowlands Pleistocene Valley Trains: 73g (Woods et al., 2004); Pleistocene Valley Trains: 73b (Chapman et al., 2002)
-234A – Southern Mississippi Alluvial Plain section of the USDA Forest Service Ecological Subregion (McNab et al., 2005)
-Alkali Post Oak Flats (Klimas et al., 2012)
-Quercus stellata/Q. marylandica Forest on Saline Soils (Heineke, 1987)

Ecological site concept

The Western Alkali Flatwoods ecological site is characterized by deep, somewhat poorly drained and poorly drained soils that formed in loess or silty, loess-like material. This site occurs on level, Pleistocene-age terraces, active alluvial terraces, and stream floodplains with slopes 0 to 2 percent. Soils of this site are high in exchangeable sodium and are noted for producing poor quality woodlands. Historically, the natural vegetation of this site likely consisted of a mosaic of herbaceous openings that graded to a sparse, post oak woodland community. Occurrences of this site may have been appropriately deemed “deer licks” or “slick spots” due to the high sodium content and open spots of bare ground.

Associated sites

F134XY202AL	**Western Wet Loess Terrace - PROVISIONAL**
F134XY209AL	**Western Moderately Wet Terrace - PROVISIONAL**

Similar sites

F134XY303LA	**West Central Natric Loess Terrace - PROVISIONAL** Soils of this site have similar natric properties.
F134XY009AL	**Northern Natric Loess Terrace - PROVISIONAL** This site occurs east of the Mississippi River and represents the eastern counterpart to the Western Alkali Flatwoods ecological site.

Table 1. Dominant plant species

Tree	(1) *Quercus stellata* (2) *Quercus marilandica*
Shrub	(1) *Vaccinium arboreum*
Herbaceous	(1) *Danthonia spicata*

Physiographic features

The Western Alkali Flatwoods ecological site is broadly distributed throughout the Western Lowlands ecoregion. Although the soils associated with the site occur in adjoining physiographic areas (e.g., Crowley’s Ridge), the core concepts of the site are best defined where it occurs on the Pleistocene terraces of the Western Lowlands.

The Western Lowlands border Crowley’s Ridge to the west and extends over a north-south distance of approximately 225 miles from Cape Girardeau, Missouri to the vicinity of Helena, Arkansas (Saucier, 1994). An irregular and sometimes ill-defined boundary of two MLRAs, 134 and 131A, meet within the Lowlands. Soils that formed in loess (considered soils of MLRA 134) occur in complex and intricate patterns with soils that formed in alluvium and eolian loamy and sandy deposits (MLRA 131A soils).

Much of the complexities of the region were borne from past events that included various outwash episodes from continental glaciation. A culmination of these events helped to create one of the region’s most characteristic landscapes, a series of ancient fluvial terraces sometimes referred to as “valley train” terraces. Each terrace was established at different time periods with the oldest feature occurring along the western margin of Crowley’s Ridge. Proceeding westward, the age of each successive terrace becomes progressively younger, and each terrace is distinguished by a drop of several feet in elevation. The oldest terrace is at least 30 feet higher than the modern floodplain of active streams on the Western Lowlands (Klimas et al., 2012).

Most modern stream systems enter the Lowlands from the Ozark Plateau or arise within basin (Klimas et al., 2009), including a few minor systems originating on Crowley’s Ridge.

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Valley train
Flooding duration	Long (7 to 30 days)
Flooding frequency	Frequent
Elevation	150–300 ft
Slope	0–3%

Ponding depth	0 in
Water table depth	6–18 in
Aspect	Aspect is not a significant factor

Climatic features

This site falls under the Humid Subtropical Climate Classification (Koppen System). The mean annual precipitation for this site from 1980 through 2010 was approximately 51 inches with a range from 34 to roughly 75 inches. Maximum precipitation occurs in spring (April and May) and late fall (November and December) and typically decreases throughout the summer. Rainfall often occurs as high-intensity, convective thunderstorms during warmer periods but moderate-intensity frontal systems can produce large amounts of rainfall during winter. Snowfall generally occurs in most years, and the average annual snowfall in the northern portions of this site in Stoddard County, Missouri is 11 inches (USDA-NRCS, 2006). The average annual maximum and minimum air temperature is 71 (range 47 to 91) and 50 (range 29 to 71) degrees F, respectively. The average frost free and freeze free periods are 208 and 234 days, respectively.

Table 3. Representative climatic features

Frost-free period (average)	208 days
Freeze-free period (average)	234 days
Precipitation total (average)	51 in

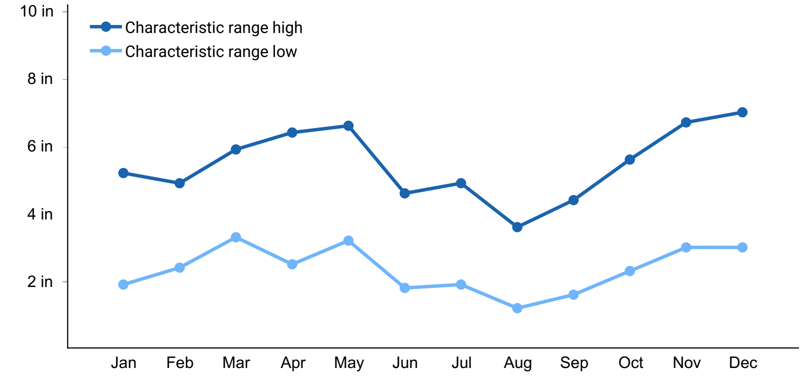

Figure 1. Monthly precipitation range

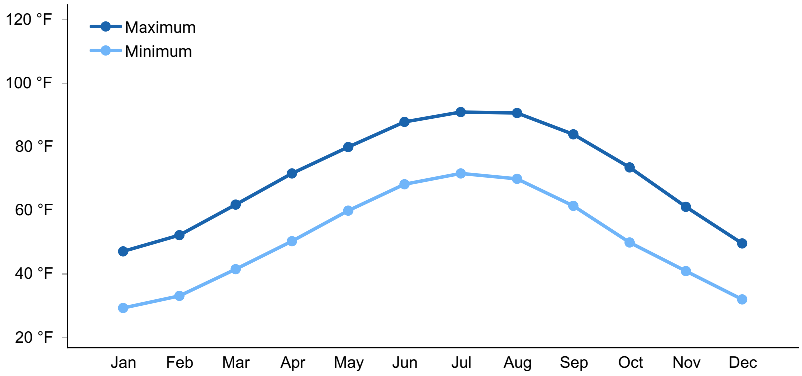

Figure 2. Monthly average minimum and maximum temperature

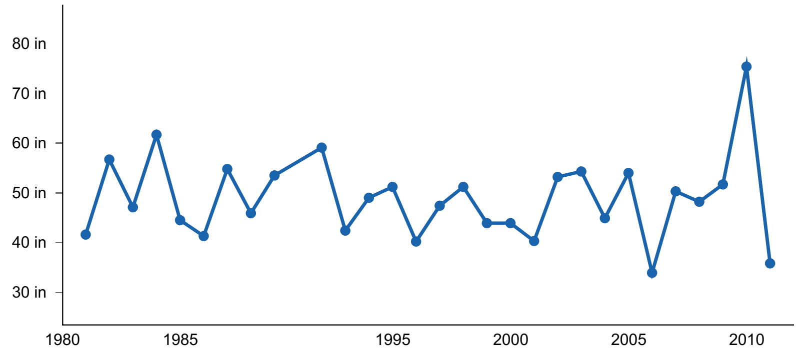

Figure 3. Annual precipitation pattern

Climate stations used

- (1) BRINKLEY [USC00030936], Brinkley, AR
- (2) CORNING [USC00031632], Corning, AR
- (3) DES ARC [USC00031968], Des Arc, AR
- (4) NEWPORT [USC00035186], Newport, AR
- (5) CLARENDON [USC00031442], Clarendon, AR
- (6) POCAHONTAS 1 [USC00035820], Pocahontas, AR
- (7) SAINT CHARLES [USC00036376], Clarendon, AR

Influencing water features

The soils associated with this site are poorly drained and have a seasonally high water table that is within 0 to 2 feet of the soil surface in late winter and spring during most years. Some local soil map units may occur near or adjacent to the active floodplain of some streams, and flooding may occur on those particular units. However, the vast majority of this site's distribution occurs outside of active floodplains. In general, this site is not influenced by a hydrologic regime. Shallow depressions occur locally within the site, and these features are typically influenced by precipitation and not from overbank flooding.

Soil features

Please note that the soils listed in this section of the description may not be all inclusive. There may be additional soils that fit the site's concepts. Additionally, the soils that provisionally form the concepts of this site may occur elsewhere, either within or outside of the MLRA and may or "may not" have the same geomorphic characteristics or support similar vegetation. Some soil map units and soil series included in this "provisional" ecological site were used as a "best fit" for a particular soil – landform catena during a specific era of soil mapping, regardless of the origin of parent material or the location of MLRA boundaries. Therefore, the listed soils may not be typical for MLRA 134 or a specific location, and the associated soil map units may warrant further investigation in a joint ecological site inventory – soil survey project. When utilizing this provisional description, the user is encouraged to verify that the area of interest meets the appropriate ecological site concepts by reviewing the soils, landform, vegetation, and physical location. If the site concepts do not match the attributes of the area of interest, please review the Similar or Associated Sites listed in the Supporting Information section of this description to determine if another site may be a better fit for your area of interest.

The soils of this site are deep, somewhat poorly to poorly drained that formed in loess or silty sediments from loess. Slopes range from 0 to 5 percent, although many areas are within 0 to 1 percent. These soils have a seasonally high water table that is within 0 to 2 feet of the soil surface in late winter and spring in most years. A key characteristic of these soils is that they are high in exchangeable sodium. This is a severe limitation to the types of plants that can tolerate these conditions, and for those plants that do occur, overall productivity is generally low. Runoff is slow and permeability is very slow due to the high concentration of sodium which causes dispersion of the clay in the subsoil.

Principal soils associated with this site include Lafe (Fine-silty, mixed, active, thermic Glossaquic Natrudalfs) and Bonn (Fine-silty, mixed, superactive, thermic Glossic Natraqualfs). Hilleman (Fine-silty, mixed, active, thermic Albic Glossic Natraqualfs) soils are provisionally included but a growing body of evidence suggests that this soil should be correlated to a different ecological site.

Lafe soils are somewhat poorly drained with slopes ranging from 0 to 5 percent. Depth to the horizon with sodium saturation of 15 percent or more ranges from 3 to 12 inches of the soil surface. Reaction ranges from strongly acid through slightly acid in the A and E horizons and mildly alkaline through strongly alkaline in the B, BC and C horizons.

Bonn soils are poorly drained with slopes ranging from 0 to 1 percent. Exchangeable sodium saturation ranges from 15 to 50 percent in all horizons below a depth of 16 inches. Reaction ranges from very strongly acid to neutral in the A and E horizons; from medium acid to strongly alkaline in the Bt horizon; and neutral to strongly alkaline in the C horizon.

Hillemann soils are somewhat poorly drained with slopes ranging from 0 to 3 percent. Depth to a subhorizon with more than 15 percent sodium saturation ranges from 16 to 36 inches. Reaction is commonly strongly acid or moderately acid in the A and E horizons; very strongly acid to moderately acid in the Bt and Btg horizons; very strongly acid to slightly acid in the upper part of the B/E horizon; and slightly acid to moderately alkaline in the lower part of the B/E horizon and in Btgn, BC and C horizons (USDA-NRCS, 2016).

The principal reason for questioning the inclusion of Hillemann soils in this ecological site pertains to a greater depth in the subsoil before strong natric properties are expressed. Greater depths before reaching high sodium saturation could contribute to higher vegetation diversity and an increase in plant productivity. Hence, Hillemann soils may warrant correlation with a different ecological site.

An additional soil that warrants mentioning that sometimes occur in complex with Bonn and Lafe is Foley (Fine-silty, mixed, active, thermic Albic Glossic Natraqualfs). The latter has natric properties, although Bonn and Lafe soils have natric horizons nearer the soil's surface. Foley is generally treated and viewed as a MLRA 131A soil, although it is formed in silty material, likely reworked loess. Foley will be treated with ecological site inventory efforts in MLRA 131A, although its inclusion may be warranted with other MLRA 134 natric soils (i.e., Bonn, Lafe, and Hillemann). One major exception to the inclusion of Foley with Bonn and Lafe soils is the depth to the natric horizon. Foley soils may be deep enough to support higher quality vegetation than the shallow restrictions of both Bonn and Lafe. Revisions and more in-depth reviews of the intricate soil - site patterns of the natric soils of the Western Lowlands must be undertaken in future survey efforts.

Table 4. Representative soil features

Surface texture	(1) Silt loam
Family particle size	(1) Loamy
Drainage class	Poorly drained to somewhat poorly drained
Permeability class	Very slow to moderate
Soil depth	4–26 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	4.5–8.3 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0–19
Soil reaction (1:1 water) (0-40in)	5.6–8.2
Subsurface fragment volume <=3" (Depth not specified)	2–3%

Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This ecological site occurs primarily on Early Wisconsin Terraces of the Western Lowlands (Klimas et al., 2012) and is characterized by soils that are high in exchangeable sodium. These “edaphic” effects (i.e., ecological influences from soil properties) have tremendous impacts on the local plant community. Where depths are shallow to a high sodium exchange horizon, limitations to rooting depth generally results in poor vegetation response. Communities that develop under these conditions often consist of stunted trees, low-quality woodlands, and open spots of bare ground. An additional characteristic of this site is the occasional presence of small, shallow depressions that pond during wetter periods of the year, generally in late winter to spring. These vernal pools contribute habitat complexity and additional plant species into an otherwise, naturally depauperate community.

The dominant species associated with the non-ponded portions of this site is post oak with associates consisting of honey locust, hawthorn, and winged elm (USDA-NRCS, 2016). Farther to the south, loblolly pine may occur in locations where depth to the natric subsoils are deeper. (This pattern may be more associated with Foley soils, which is currently under review.) Structurally, the site is relatively open, which provides conditions suitable for the development of a herbaceous ground layer. Ground cover may consist of poverty oat grass, threeawns, dropseeds, and sedges (USDA-NRCS, 2016). Vernal pools of this site generally support a greater concentration of water oak and willow oak (Klimas et.al, 2012).

Historically, fire was probably a key factor or influence on this site, and a range of habitat or community types likely existed. Where trees occurred, conditions probably ranged from savanna to open woodlands. Locally, meadows or prairies likely existed in a patchwork pattern among the woodlands and/or savannas. This mosaic likely persisted as a “physiognomic gradient” with meadows grading to savannas and savannas grading to woodland – and vice versa.

Today, various land use activities have been attempted on this site. Some areas that were once cleared and farmed are now idle. Such abandoned areas now support a moderate to dense cover of oaks and hickory, which may occur mainly on Bonn and/or Lafe soils. However, there are large acreages of this site under cultivation. Those sites generally occur on Hillemann soils. Where rooting depths to natric subsoils are shallow (e.g., Bonn and Lafe), yields are likely to be poor and those spots avoided. In general, the soils most aligned with the concepts of this site, Bonn and Lafe, are considered to have low potential for productive cropland (USDA-SCS, 1978). Conversely, Hillemann soils have moderate limitations for cropland due to wetness (Capability Class: 2w; USDA-NRCS, 2006b).

A minor use on this site is reportedly pastureland and hayland, though grazing periods may be limited to shorter periods in the spring (USDA-NRCS, 2016). The more productive pastures are mainly limited to areas where the depth to natric subsoils are much greater, (e.g., Hillemann soils). Limitations for pastureland and/or hayland are the same as those for cropland.

Woodland or forest production on this site is poorly suited on Bonn and Lafe soils (USDA-SCS, 1978) and those areas are generally avoided. However, Hillemann soils reportedly produce higher quality timber that include cherrybark oak, sweetgum, and water oak.

Of note, the apparently more productive soils of Hillemann should be considered for removal from this site and inclusion into an ecological site more consistent with the productivity and community components it supports.

Following this narrative, a “provisional” state and transition model is provided that includes the “perceived” reference state and several alternative (or altered) vegetation states that have been observed and/or projected for the Western Alkali Flatwoods ecological site. This model is based on limited inventories, literature, expert knowledge, and interpretations. Plant communities will differ across MLRA 134 due to natural variability in climate, soils, and physiography. Depending on objectives, the reference plant community may not necessarily be the management goal.

The environmental and biological characteristics of this site are complex and dynamic. As such, the following diagram suggests pathways that the vegetation on this site might take, given that the modal concepts of climate and soils are met within an area of interest. Specific locations with unique soils and disturbance histories may have alternate pathways that are not represented in the model. This information is intended to show the possibilities within a given set of circumstances and represents the initial steps toward developing a defensible description and model. The model and associated information are subject to change as knowledge increases and new information is garnered. This is an iterative process. Most importantly, local and/or state professional guidance should always be sought before pursuing a treatment scenario.

State and transition model

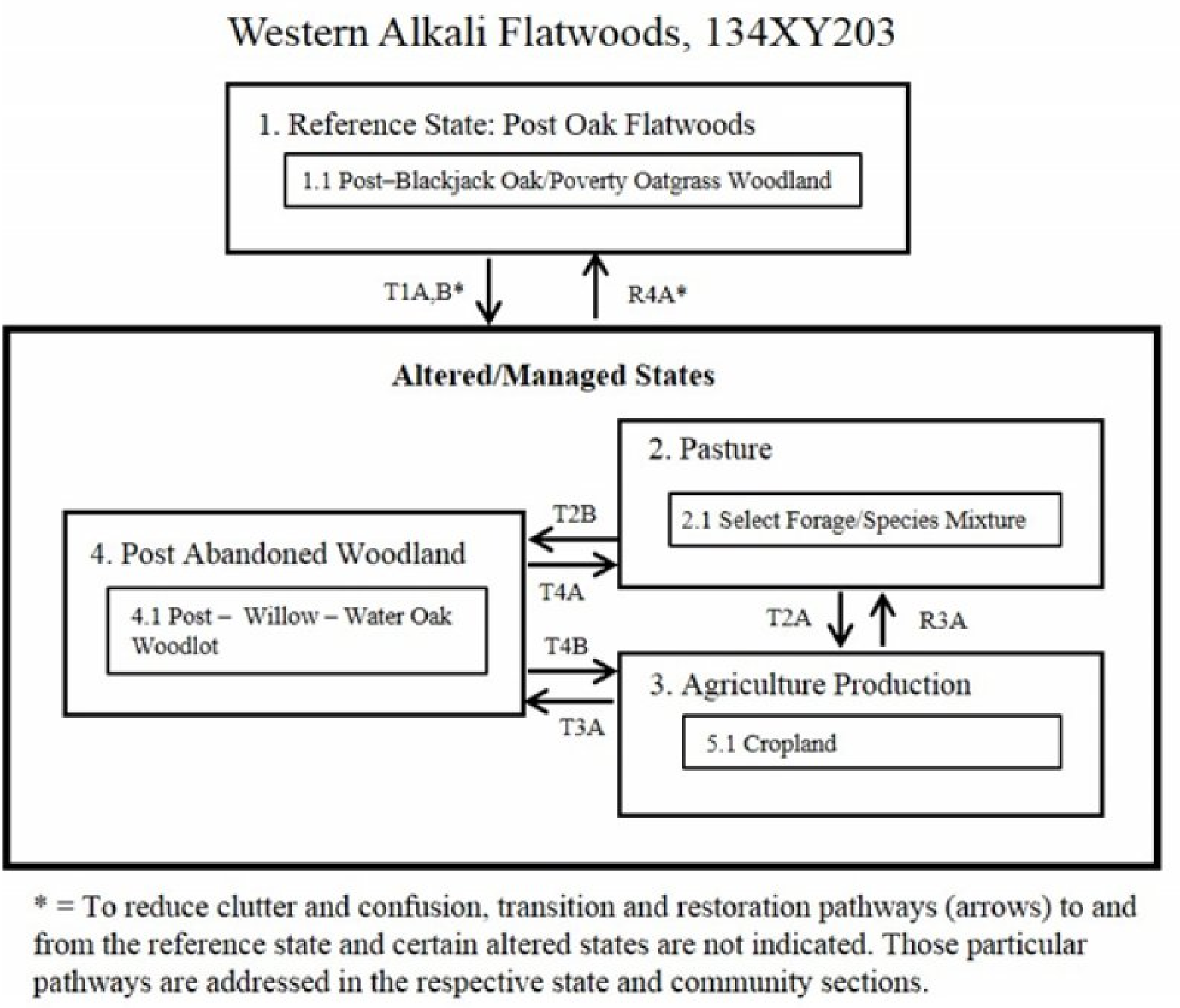

Figure 5. STM - Western Alkali Flatwoods

Pathway	Practice
T1A, R3A, T4A	mechanical removal of vegetation; herbicide application; seedbed preparation; planting desired species at appropriate rate (State 2)
T1B, T2A, T4B	mechanical removal of vegetation; potential construction of artificial drainage system, preparation for cultivation (State 3)
T2B, T3A	natural succession (State 4)
R4A	natural succession; return of maintenance or disturbance (e.g., fire); any former alteration to soil drainage MUST be restored before returning to true reference conditions (State 1)

Figure 6. Legend - Western Alkali Flatwoods

State 1
Post Oak Flatwoods

The key factors influencing the plant community of this site are the soils. The high exchangeable sodium of the subsoil limits the types of plants that can tolerant these extreme conditions. Heineke (1987) compared the natural community of this site to the "…xeric, acidic, rocky blufftops of the Ozark Plateau." The trees are stunted, twisted, and small with diameters that seldom reach 12 inches. Heineke reported observations from others that discovered trees below 12 inches having ages of 170 years. The structure of representative stands are park-like with much of the ground surface being covered by lichens. The pre-settlement community of this ecological site may have consisted of a complex of seral stages that included meadow or barren-like conditions, savannas, to open woodland. Fire may have been a key disturbance factor, historically, particularly where fires extended onto this site from adjoining or nearby areas. Barren-like conditions (i.e., local bare spots) may have existed locally where depths to natric horizons were very shallow. Such "bare spots" would represent pedons of extreme root restriction.

Community 1.1
Post Oak – Blackjack Oak – Poverty Oatgrass Woodland

This community phase represents the successional stage, compositional, and structural complexity of stands supporting perceived reference conditions. Post oak is reported as the dominant species on this site; however willow oak and water oak occur within small, shallow depressions (Klimas et al., 2012). These depressions or vernal pools are ponded only during the wetter times of the year, winter to spring. Additional components and characteristics of the system include the presence of blackjack oak with an understory of hawthorn, persimmon, winged elm, and farkleberry. Ground cover may consist of prairie blazing star, poverty oatgrass, broomsedge, woodoats, and tridens. Most notable of the ground layer is the coverage of lichens and mosses, which are interspersed by areas of bare ground. A central structural characteristic of the reference community phase is an open woodland profile. The subcanopy stratum is open throughout much of the community and the ground layer is thinly covered (Heineke, 1987).

State 2
Pasture

This state is representative of sites that have been converted to and maintained in pasture and forage cropland, typically a grass – legume mixture. However, soils exhibiting the core concepts of this site (i.e., a relatively shallow depth to a root restriction layer of high sodium content), are known for producing poor pasturage. Areas where natric horizons are deeper have a much better chance in pasture development and management. Planning or prescribing the intensity, frequency, timing, and duration of grazing can help maintain desirable forage mixtures at sufficient density and vigor (USDA-NRCS, 2010; Green et al., 2006). Overgrazed pastures can lead to soil compaction and numerous bare spots, further complicating the natural limitations of this site. Because of the limitations of this site, grazing may be limited to small intervals within the appropriate season(s). These soils have low available water capacity, low nutrients, and are prone to droughtiness. It is strongly advised that consultation with State Grazing Land Specialists and District Conservationists at local NRCS Service Centers be sought when assistance is needed in developing management recommendations or prescribed grazing practices on this site.

Community 2.1
Select Forage/Species Mixture

This community phase represents commonly planted forage species on pasturelands, haylands, and open grasslands. The suite of plants established on any given site may vary considerably depending upon purpose, management goals, usage, and soils. The limitations of this site preclude many of the commonly planted mixtures. However, there is some indication that tall fescue, common bermudagrass, and annual lespedeza have been planted on this site, but yields are reported as low. This site is generally considered poorly suited to not suited for this land use (USDA-NRCS, 2006b). Should active management (and grazing) of the pastureland be halted, this phase will transition to "old field" conditions, which is the transitional period between a predominantly open, herbaceous field and the brushy stage of a newly initiated stand of trees.

State 3
Agriculture Production

Agriculture production on this site is fairly limited. Crops that are or have been grown include soybean and rice but plants may be stunted and often will not reach maturity (USDA-NRCS, 2006b). Many idle woodlots today were likely cropped at some point in the past and met with disappointing results.

Community 3.1
Cropland

Soybean and rice (USDA-NRCS, 2006b).

State 4
Post Abandoned Woodland

Most, if not all, of the woodlots and local patches of woodlands occurring on this site represent this state. Former cropland and pastureland that failed to meet expectations were abandoned and are now considered “idle”. These stands still support some of the components that characterizes the community. The structure of these stands are typically denser than a late development, fire-influenced stand. However, small openings and a ground cover of herbaceous species provide indications of strong edaphic influences. Restoration potential of these sites back to reference conditions may be fairly high, provided the appropriate management regime is initiated and maintained.

Community 4.1
Post – Willow – Water Oak Woodlot

This community phase represents the species characteristic of the regenerating woodlots. Post oak is often the dominant species with associates consisting of willow oak, water oak, southern red oak, hickory, and winged elm.

Transition T1A
State 1 to 2

This pathway represents an attempt to convert the woodland community to pasture or forage production. Actions include clearing, stump removal, herbicide application, seedbed preparation, and the establishment of desired plants (State 2).

Transition T1B
State 1 to 3

Actions include mechanical removal of vegetation and stumps; herbicide treatment of residual plants; and preparation for planting (State 3).

Transition T2A
State 2 to 3

Actions include removal of vegetation or pasturage; herbicide treatment of residual plants; and preparation for planting.

Transition T2B
State 2 to 4

Abandonment of grassland/pastureland management and allowing natural succession to proceed beyond the old field stage to canopy development of the young woodland.

Restoration pathway R3A
State 3 to 2

Seedbed preparation and establishment of desired forage/grassland mixture.

Transition T3A
State 3 to 4

Abandonment of cropland management and allowing natural succession to proceed to canopy development of the young woodland.

Restoration pathway R4A
State 4 to 1

This pathway represents natural succession back to perceived reference conditions. The period required for this transition to take place likely varies by location and is dependent upon local site conditions. In some cases, a return to the reference state may not be possible without considerable management effort. That effort may involve exotic species control, restoration of the natural hydrologic regime of a given locality, and the reestablishment of components considered characteristic of the reference state.

Transition T4A
State 4 to 2

This pathway represents an attempt to convert the woodland community to pasture or forage production. Actions include clearing, stump removal, herbicide application, seedbed preparation, and the establishment of desired plants (State 2).

Transition T4B
State 4 to 3

Actions include mechanical removal of vegetation and stumps; herbicide treatment of residual plants; and preparation for planting (State 3).

Additional community tables

Other references

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Contributors

Barry Hart

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**